METHOD FOR PRODUCING ATTACHED PARTS FOR A VEHICLE AND THE THUS PRODUCED ATTACHED PARTS

Description

The invention relates to a method for producing attached parts for a motor vehicle, for example doors, dampers, mudguards formed by at least one internal sheet and at least one external sheet, said sheets being produced separately from each other and subsequently joined together at their edgs, and the invention also relates to an attached part for a motor vehicle produced in accordance with such a method.

In general, it is state of the art in technology to join internal sheets and external sheets by flanging. This method calls for high dimensional accuracy of those components to be joined and it might be required to take additional measures, e.g. applying an adhesive to obtain a lasting connection.

EP 200 997 B1 discloses a welded connection of two light-gauge sheets, of which one external sheet forms an optically smooth exterior surface, the edge of which is flanged by 180° onto its rear area, and wherein the internal sheet is laid onto the flanged edge of the external sheet, and wherein the connection of the internal sheet with the flanged edge is made by a laser beam from the side averted from the exterior surface. In addition, the internal sheet in the edge area can also be flanged by 180°.

EP 855 965 B1 discloses a motor vehicle door with an internal sheet and an external sheet, wherein the edge strips of the internal sheet and of the external sheet are bent and wherein the edge strips of these sheets laid one above the other are welded together by a laser beam directed into the gap between the two edge strips. The vertical bend at the entire circumference of the sheets with the smallest possible joining gap involves a sophisticated box-like stacking and positioning of the components to each other. The gap which is required for box-like stacking is then formed between the sides lying opposite to each other, thus constituting the joining gap. The required component tolerances can hardly be met in deep drawing. It is also disadvantageous that the gap cannot be influenced any more by shifting the inner part. The gap can only be reduced by deformation of the external sheet, whereby the strains and stresses thus occurring may affect the outer skin and produce dips.

DE 100 37 303 A1 describes a method for producing a motor vehicle door, wherein the door inner part is entirely or partly made of aluminum and the door external sheet is completely made of aluminum. According to this method, the edge area of the door external sheet at the entire circumferential area is inwardly bent by approx. 90° and brought in contact at a machined front area of the door inner part to allow for executing the laser welding operation. In producing this door, too, positioning and box-like stacking is difficult, leading to the a.m. problematic situation concerning tolerance, gap, and dips.

Furthermore known from DE 199 32 415 C1 is a method according to this species for laser beam welding of a motor vehicle door or motor vehicle damper, wherein the edges of the sheets to be joined are inwardly bent in the same direction at the entire circumference of the door and wherein the sheets are welded together in the edge area of the edge strips, maintaining a certain space for degassing. With this method, too, a uniformly thin joining gap must be established at the entire circumference, involving substantial expenditure for laser welding.

Now, therefore, it is the task of the present invention to propose a method for producing an attached part that allows for high process safety based upon simplified box-like stacking and positioning of the joining components to each other while reducing the joining gaps at the same time.

To solve this task, the characterizing feature of Claim 1 provides for that

a) the external sheet (2)is inwardly bent at sides (3, 4) visible from outside in the edge area of the attached part, and that the pertaining edge areas (14 – 19) of the internal sheet (1) are shifted against the bend (7) of the external sheet (2) to minimize the gap, and that the internal sheet (1) and external sheet (2) are welded together by a laser beam (20) directed into the gap between the edge areas (14 - 19) of the internal sheet (1) and the bend (7) of the external sheet (2), and

b) the edges of the external sheet (2) and internal sheet (1) are basically laid on each other in parallel to the component plane at one side at least or at all invisible sides (5, 6) in the edge area of the attached part lying opposite to the visible area(s) and are

laser-welded in an overlap joint or laser-welded or laser-soldered in the fillet of the overlapping parts.

Hence, with the method according to the present invention, the internal sheet and external sheet of the attached parts have different joining geometries at the edges which are dependent upon whether or not the joined edge areas at these sides in their final status are visible from outside. At those sides visible from outside in the built-in status of the component, the external sheet in the edge area is inwardly bent, and the internal sheet is accordingly pushed against the bend, and the laser beam is directed into the gap between the two bordering areas for welding. At the edge areas of those sides of the attached part that are not visible in the built-in status of the component, the edges of the external sheet and internal sheet are basically laid one above the other in parallel to the component plane and laser-welded in an overlap joint or laser-welded or laser-soldered in the fillet of the overlapping parts. According to the method being the subject of the present invention, the internal sheets and external sheets can be positioned exactly with high processing safety, particularly at those sides visible from outside, and the inwardly bent bordering edges are largely brought in complete contact or at least the joining gap into which the laser beam is directed is reduced to a minimum by making the tolerance offset at the invisible edges between the internal sheet and external sheet.

The relevant sub-claims contain supplementary purposive measures.

It has turned out to be particularly advantageous to inwardly bend and join the visible area of the external sheet at least at the door sill side and/or door lock side of a motor vehicle door. Then, the opposite invisible edge areas of the hinge side and/or window side of the door external sheet lying evenly on each other can be connected to the door internal sheet in the edge areas in the overlap joint by laser welding or in the fillet of the overlapping components by laser welding and laser soldering.

To provide a suitable gap into which the laser beam is directed in exact position, it has turned out to be favourable to arrange the bend of the external sheet at an angle to the external sheet itself being greater than or equal to 90° and/or to inwardly bend the edge of the external sheet by maximally 90°. The edge areas of the internal sheet can then be bent in a suitable manner inwardly or outwardly to allow for joining with the bend, wherein particularly the bends of

both sheets form an acute angle. However, the edge areas of the internal sheet can also be bent inwardly or outwardly by up to 180° so that the outer edge at the bend of the external sheet is brought in contact. Finally, it has turned out to be favourable to bevel the front side of the edge area of the internal sheet in such a manner that it also forms an acute angle to the bend of the external sheet. This has proved particularly favourable if the edge area of the internal sheet is particularly thick.

The invention is explained in more detail based upon the enclosed FIG. 1 to 9 by way of an example of a door for motor vehicles, in which

FIG. 1 + 2	show schematic side views of motor vehicle doors
FIG. 3	shows a section according to Line A-A of FIG. 2
FIG. 4a-4c	each show a section according to Line B-B of FIG. 2
FIG. 5 – 9	show special embodiments for a section according to Line C-C of FIG. 1

FIG. 1 and 2 show a rear side door of a private motor vehicle in a schematic side view from outside, wherein the sill side 3 and the lock side 4 constitute the so-called visible edge areas, while the hinge side 5 and the window side 6 represent the invisible edge areas of the external sheet 2. According to the present invention, the edges of the external sheet 2 at the sides 3 and 4 are inwardly bent by up to 90°. This bend 7 is illustrated in FIG. 5 to 9. At the opposite sides 5 and 6, the edge areas 8 of the external sheet 2 are no longer visible after attachment of the component, because they disappear, for example, behind the front mudguard or under the window rubber seal. As shown in FIG. 3 and 4a to 4c, these edge areas 8 of the external sheet 2 and the edge areas 9 of the internal sheet 1, for example, are laid one above the other by the aid of clamping grips 13 to allow for the welding operations, so that a laser weld seam 10 is established in the overlap joint (compare FIG. 3 and 4a) or a fillet weld 11 or laser soldering seam 12 (compare FIG. 4b and 4c) is established in the fillet of the overlapping parts by the aid of a laser beam 20.

With a basically identical bend 7 of the external sheet 2, FIG. 5 to 9 show various embodiments for the edge areas 14 to 18 of the internal sheet. In the exterior area, the internal sheet 1 is initially arranged basically in parallel to the external sheet 2. According to FIG: 5, the edge area 14 is then bent to the external sheet 2 by a little less than 90°, so that the laser beam 20 is directed into an acute angle formed by the edge area 14 and the bend 7. According

to FIG. 6, both the edge area 15 and the bend 7 are directed towards the private motor vehicle inside and they, too, form an acute angle for the laser beam 20.

In FIG. 7 and 8, the edge areas are bent by 180° inwardly, edge area 17, and/or outwardly, edge area 16. The external arch of the bent internal sheet 1 is brought in contact at the bend 7, so that the laser beam 20 is directed into the gap formed by the arch and the bend 7 (compare FIG. 7 and 8).

In FIG: 9, at least the edge area 18 of the internal sheet 1 is much thicker than it is in the other embodiments. Here, the front side 19, which is preferably chamfered additionally, can be brought in contact at the bend 7, so that here, too, the laser beam 20 can be directed into the gap forming an acute angle.

List of References:

1	Door internal sheet
2	Door external sheet
3	Sill side
4	Lock side
5	Hinge side
6	Window side
7	Bend at 2
8	Edge area of 2
9	Edge area of 1
10	Laser weld seam
11	Fillet weld seam
12	Laser soldering seam
13	Clamping grip
14	Edge area of 1
15	Edge area of 1
16	Edge area of 1
17	Edge area of 1
18	Edge area of 1
19	Front side of 1
20	Laser beam